

made, that the surface of the bed of glacial clay is only 85 centimetres below the present level of the lake, and 4 metres above its bottom at Geneva. Hence the level of the lake at the time in question must have been at least 3 metres above its present level, for otherwise the Lower Rhone could not have existed. As regards these estimates, it should be remembered that the difference in time between the maximum and minimum levels of the lake has to be reckoned by centuries, and that the volume of rivers and lakes fed by Alpine snows varies with the seasons."

M. LESSAR, who made last year an interesting journey to Saraks, has returned from a second journey in the same country, as far as Herat, and publishes an account of it in the *Golos*. All the route, from Askabad to Saraks, 185 miles, goes along the foot of mountains through a completely flat country, which is usually called Attek. This name, however, which signifies "the foot of the mountains," is unknown in Persia and Afghanistan. That part of this oasis, which was occupied by the Tekke-Turcomans, was usually known as Akhal, whilst the south-eastern part of the oasis was known as Arakadj. Only two places of the Attek, Luftabad and Shilghyan, are occupied by Persian Shiites, the remainder are Turcomans, having immigrated from Merv after a bloody struggle with the former inhabitants, at the beginning of this century. The population live mostly in clay-houses, the number of felt tents diminishing very rapidly, and the clay-houses which formerly were built within small earthen fortifications, are now mostly erected outside of them. Water is scarce in the Attek, the streams coming down from mountains being few, and in the hands of Persians, who often take the water for their fields. The population of the Attek, between Askabad and Saraks, is estimated by M. Lessar, at about 7000 Turcoman inhabitants. They carry on agriculture, and have good orchards, as well as good gardens in the neighbourhood of the Persian settlements. But altogether they are very poor.

A TELEGRAM, dated Isefjord, September 5, has been received in Stockholm, *via* Tromsø, from the Swedish Geological Expedition dispatched to Spitzbergen, according to which snow covered the island as early as August 30, and the members were thus compelled to discontinue their researches, and intended to sail for Beeren Island. The results of their labours are very important. All was well with the Meteorological Expedition at Smith's Observatory.

ANOTHER message, similarly conveyed, but dated August 24, has also been received from the Swedish Meteorological Expedition, from which it appears that observations commenced at Smith's Observatory on August 15, with the exception of the magnetical, which were delayed until the 21st, in consequence of the difficulty in firmly fixing the instruments. From August 15 to 21 the mean temperature and the readings of the barometer were respectively as follows:—15th, temp.  $+3^{\circ}1'$  C., bar. 748; 16th, temp.  $+1^{\circ}5'$  C., bar. 749; 17th, temp.  $+3^{\circ}9'$  C., bar. 749; 18th, temp.  $+3^{\circ}6'$  C., bar. 752; 19th, temp.  $+3^{\circ}7'$  C., bar. 754; 20th, temp.  $+4^{\circ}5'$  C., bar. 751; 21st, temp.  $+3^{\circ}9'$  C., bar. 752. At mid-day of the 16th snow fell, while pools became covered with ice; the minimum temperature was  $+0^{\circ}1'$  C. The weather had up to that date been dull with little rain. Wind being generally from west to east, with an average force of 1 (Beaufort's scale). There was little ice at sea, but the fact that four smacks had been frozen in in Storfjord caused the members some anxiety, as they were not quite prepared, as yet, to face the winter. As these four vessels have since got away, this will probably be the last message we shall obtain from the expedition this year.

OWING to the enormous quantities of drift-ice in the Kara Sea the steamer *A. E. Nordenskjöld*, bound for the Jenisei, has put back to Vardö. Capt. Johannsen states that he attempted four times—August 31, September 1, 7, 8—to penetrate Matschkin Schar, and was compelled to turn back. He went up alongside Waigats Island into the Kara Strait, where he saw ice as far as  $54^{\circ}$  long., and would have been frozen in here, if the vessel had not possessed such powerful machinery.

HERR KARL PETTERSEN, of Tromsø, has given the name of "Arktis" to a great land-mass which he maintains at one time extended between Norway, Novaya Zemlya, and Spitzbergen. His theory is based mainly on the existence of a submarine plateau which recent Norwegian expeditions have found in the region referred to. He also maintains that such a land-mass

would account for the present geological and biological conditions of Norway and Spitzbergen, and that it extended to the conclusion of the Quaternary period.

PARTS 6 to 10 of the new edition of Balbi's "Allgemeine Erdbeschreibung" have been sent us by Hartleben of Vienna. The recasting of the work by Dr. Chavanne continues to be thoroughly carried out, and the illustrations and maps are very good.

DR. OTTO FINSCH, who for the last two and a half years has been travelling in Polynesia and Australia, under the auspices of the Berlin Academy of Sciences, may soon be expected home. A large part of his rich collections in all departments of natural science and ethnography, has already arrived in Berlin, and the rest is on the way. He has visited the Sandwich Islands, the Marshall group, where he stayed a long time, the Carolines and New Britain, New Zealand, Australia, and Tasmania. He stayed for a considerable time among the islands in Torres Straits, as well as on the south coast of New Guinea.

THE permanent Commission of the "Association Geodesque Européenne," the object of which is to promote the measurement of the earth by General Bayer's system, has been meeting at the Hague under the presidency of the Spanish General Hanez. Representatives of France, Austria, Germany, Italy, Spain, Switzerland, Norway, Roumania, and Holland attended the first meeting, and were welcomed by the Dutch Foreign Minister, Mr. Rochussen. Prof. Oppolzer (Austria), who is the secretary of the deputation, gave the annual report of the Association. Several other members presented communications upon the geodesic work in their respective countries.

AN edition for 1882 of the "Handbook of Jamaica," the first issue of which we noticed at length, has been published. Several important alterations and additions have been made. Stanford is the London agent.

THE new number of the *Deutsche Geographische Blätter* of the Bremen Geographical Society, contains some long communications from the Brothers Krause, who have been wintering at Chilkoot, in North-west America. They give details concerning journeys which they made during the past winter and spring, in which, among other things, they obtained much information concerning the Chilkoot Indians. The number also contains an interesting lecture by Prof. Karl Möbius, on the influence of food supplies on the spread and migration of animals. Dr. Fr. Hirth has two communications:—On the Walls of the Towns of Kwang-tung, and on the Chinese Coast from the boundary of Annam to Tien-pai, from Chinese sources.

IN consequence of the very hot and dry weather experienced in Russia during this summer, the water has become very shallow in all rivers, so that navigation meets with great difficulties on the Volga and Northern Dwina.

WE regret to learn from a telegram received at Copenhagen from Vardöe that it is feared the Danish North Polar Expedition under Lieut. Hovgaard is already ice-bound on the coast of Novaya Zemlya. The Kara Sea was closed by ice in the middle of August. It will be remembered that Lieut. Hovgaard intended to make for Cape Chelzuskun, from which he was to make an attempt to force his way northwards.

### UNWRITTEN HISTORY, AND HOW TO READ IT<sup>1</sup>

IT has now for some years been the custom at the meetings of the British Association for the Advancement of Science, for one of its members to be deputed to deliver a lecture, not to his fellow-members, for whom in the ordinary programme an amply sufficient supply of mental food has been provided, but to the operative classes, in the town where the annual meeting happens to be held. Such a custom has much to commend it, for all alike—the rich and the poor, the worker with the head and the worker with the hand—are interested in the advancement of that science, or "natural knowledge," for the promotion of which this association, like its elder brother the Royal Society, was founded.

An occasion like the present, moreover, gives a good

<sup>1</sup> A lecture to the working classes, delivered at the meeting of the British Association for the advancement of science, held at Southampton, August, 1882, by John Evans, D.C.L., LL.D., F.R.S., &c. Revised by the Author.

opportunity of treating of some subject which lies within the range of all observers of what is going on in the world around them, which may even be of local interest, or to speculate on which may give an additional zest to an evening stroll or a day's relaxation from toil. It is not, however, easy to find a subject of this kind; and yet, perhaps, if I talk to you this evening of those who, in times more or less remote from the present day, have lived and laboured in this part of the globe, I shall at all events have a theme of some general human interest. And if, in addition to laying some particulars of their method of life before you, I can point out the methods by which our knowledge of the manners and customs of remote antiquity is obtained; if I show you the way in which the successive links in the chain of circumstantial evidence relating to human progress are forged, you will be able to appreciate the value of the application of scientific methods to the study of the past, and to feel that our present knowledge of antiquity rests upon something more secure than vague conjecture. It is fortunate for me that in and around this town of Southampton is what may be termed the home of some of the witnesses I propose to call, so that if I am able to interest you in what they have to reveal, many of you will have the opportunity of examining them and cross-examining them yourselves at your leisure. The subject of my lecture, "Unwritten History, and how to read it," is, as you may imagine, is one in which testimony of various kinds is admissible; and, as in the case of many of the most important trials, much may depend upon what, at first sight, would appear to be a trivial common matter.

The term which I have used, "Unwritten History," is so comprehensive that it might be made to embrace the whole series of events which have happened in this world from its first creation until the written annals of the historian begin. It might be expanded so as to comprise the whole of the geological record, as exhibited by the testimony of the rocks, and even to go back to a time when it seems probable that the elements composing our globe had not been consolidated, but existed in a gaseous condition. I propose, however, to limit the term this evening, so that it may not extend beyond the period during which the human race has dwelt upon the earth. I need hardly say that, compared with the time which geological facts prove that the world has existed, this period of human occupancy is relatively short, however vast it may appear when we come to compare it with the few centuries embraced in our ordinary chronology. But of this it will be time to speak when we have traced back our evidence as far as our present knowledge will enable us to go.

With regard to that evidence, or the means by which we must attempt to read unwritten history, one of the principal aids that can be called in is the written history of the past. The ancient writings of Greek and Roman authors carry us back some three thousand years; while the annals of Egypt and Assyria, and those preserved in the pages of our Bibles, make us to some extent acquainted with the habits and customs of still earlier times. And in the same way the accounts of recent travellers who have been brought in contact with races of men unacquainted with even the most simple appliances of modern civilisation, serve to throw a light on what must have been the condition of most of the occupants of other parts of the world before those appliances were known. But, after all, our best evidence is to be derived from the relics of the past which, from time to time, we find buried in the earth, and from the circumstances under which they are discovered. Such relics are often of much service even in illustrating that portion of past time which falls within the limits of written history, especially so far as relates to the habits and customs of everyday life, as to which, except incidentally, our chroniclers are usually silent. The "princes and kings" who "flourish or may fade," "the unsuccessful and successful wars" whose records make up the bulk of our histories no doubt possess an interest of their own; but all that relates to the infancy and childhood of the human family and the development of its mental and material resources has for many minds a far greater charm, and much that concerns it is only to be gathered from a study of unwritten history.

But before going back to any really prehistoric times, it will be well to consider briefly a few points in connection with the written history of the town in which we are assembled. It was not always called Southampton, but was in Saxon times known as Hamtune, and under that name appears upon coins struck at the local mint from the middle of the tenth until the middle of the twelfth century. In the same manner Northampton was at one time only known as Hamtune, and it was to distinguish these

two towns that the one received the prefix of North- and the other of Southampton.

Curiously enough, the name of Hamtune, which appears to be compounded of two well known Saxon words—Ham, our English home, a farm or possession; and, Tūne, the modern town—is more probably, both at Northampton and at Southampton, connected with the old British name of the river which flows past the town. The Nene of Northamptonshire seems to be called the Antona or Anton by the Roman historian Tacitus; and the Test of "Suthamtescire," as the country of this town is called by the Venerable Bede, still retains in part of its course this same name of Anton. The old geographer Ptolemy calls Southampton Water the mouths of the river Tris-anton, or possibly the three mouths of the Anton; and the Roman town which stood near this place was known by the name of Clausentum, which Camden interprets as a Latinised form of the British Claudh-Anton, the port of Anton.

I shall not attempt to determine the claims of Bittern, or Old Hamtune, to represent the Roman town; but the fact that Roman remains still exist here may be cited as a proof that whatever may have been the encroachments of the sea since Roman times, they have not destroyed all traces of the Roman settlement on this site, nor can the relative positions of the sea and the land have materially altered within the last 1800 years. It will be well to remember this when we hereafter come to consider the antiquity of some of the earlier traces of the presence of man in this part of the world. When, once, in ascending the stream of time, we have passed the date of the Roman occupation of this country, we enter upon the domain of unwritten history, or at all events find ourselves within its border provinces.

Who were the people whom the Romans found here on their arrival, and what was their civilisation? Historians give us some information on this point, which is, however, to be supplemented from other sources. Cæsar, whose invasions of Britain date some ninety years earlier than the actual Roman conquest, tells us that the southern part of this island was occupied by Belgic tribes who had come over from the Continent, who for the most part retained their original names, and were often subject to the same chiefs as their brethren on the mainland. Those who occupied this part of Britain appear to have been the Belgæ, whose name at least has on the other side of the Channel survived in that of Belgium. The habits and customs of these southern Britons were the same as those of the Gauls. They were acquainted with iron, gold, silver, copper, tin, and bronze, and had, moreover, a coinage of their own. Our knowledge of this coinage is not, however, derived from any ancient historians, but from a study of the coins themselves. By a careful record of the spots where coins of the Ancient Britons have been found we have been able to show that particular forms belong to particular districts, and, in the case of some of the coins which bear inscriptions, to determine the names of British princes, and to fix the districts in which they reigned. Here in Hants, and in the neighbouring county of Sussex, we find coins struck by two Princes, Tincommius and Verica, as to whom written history is silent, but who appear from their coins to have been the sons of Commius, who probably is the Commius mentioned by Cæsar.

It has been supposed, from a passage in Cæsar's "Commentaries," that the Britons in his time were unacquainted with the use of coined money; but this passage may have been misread. At all events, the coins themselves prove that the supposition is erroneous, and, moreover, that long before Cæsar's time a native coinage existed in Britain. You may ask how this can be proved by coins which bear neither dates nor inscriptions. I will attempt to answer this question, and to show you in what manner this chapter of unwritten history has been read. Coins such as we now know them, struck of a certain weight and with some established device upon them, were unknown even among the most civilised nations of antiquity until about seven hundred years before Christ; and it was not until about three hundred and fifty years before Christ that any extensive coinage of gold was issued at any one place. About that time some mines were discovered in Macedonia which produced about £250,000 worth of gold annually. Most of this was converted into coins rather heavier than our sovereigns, by Philip II. of Macedon, the father of Alexander the Great. These coins bore on the one side a head with a laurel-wreath upon it, and on the other a Victory, in a two-horse chariot. The coins were so well known, and gold from other sources was comparatively so scarce, that the use of these pieces, which were known as *Philippi*, spread



through the whole of Greece and her colonies along the shores of the Mediterranean. Whether as the result of raids upon Greek towns, or from more peaceful contact with Greek colonies in what is now the south of France, the Gauls became acquainted with them, recognised their usefulness, and proceeded to strike coins in imitation of them. As was to be expected, the art of these imitations was far inferior to that of the original coins. Each copy in its turn served as a model from which other copies were made, and as is often the case, the copies were in many instances larger than the originals; so that by the time the art of coining had reached the northern part of Gaul the size of the coin had much increased, and the devices upon it had degenerated into a widespread bust with a laurel-wreath, and with the hair arranged in rows of locks of even size behind, and in crescent-shaped curls in front, while additions had been made to the original head in the shape of a kind of band around it and an ornamental covering for the neck. Such coins have been found in considerable numbers in England, principally in our southern counties, and especially in Kent. Of their origin from the Macedonian *Philippus* there can be no doubt; but how are we to judge of their date, and of the length of time that coins were known in Britain before Cæsar's landing? It is in this manner:—There are some British princes whose names are recorded by Roman historians and by Roman inscriptions, and to whom therefore we can assign a fairly certain date; and of some of these princes coins are known. They have on them devices such as at first sight appear almost unintelligible, but which by a succession of intermediate forms occurring on coins without inscriptions upon them, can be traced back to the head with the laurel-wreath, while on the reverse side there is always a horse of more or less barbarous form. We have, therefore, evidence of an uninterrupted succession of coins copied the one from the other, beginning with the coins with the widespread head and ending with the inscribed coins. Now each of these successive copies must have been intended to pass current with the coins from which they were copied, and if they had all been of one weight and of one quality of gold it might have been possible for the whole series to have been struck within no very lengthened terms of years. But, as it happens, there is a great diversity in the weight and fineness of the coins, those with the widespread head being of fine gold, and often weighing nearly 120 grains, and the last of the series being of much baser metal and only weighing about 84 grains. In the process of successive copying only the most striking parts of the device, and those most easy to imitate, such as the wreath and locks of hair, survived, and the face, being more difficult to copy, was the first to disappear. Coins with merely a mis-shapen lump upon them in lieu of the face usually weigh about 96 grains, and the farther they get from the original the lighter the coins become. Now the original weight of the *Philippus* was 133 grains; and assuming that it was first imitated in B.C. 300, and that the weight had become reduced to 84 grains in B.C. 20, and also that the diminution in weight always went on at the same rate, we find by calculation that the date at which the weight would have become reduced to 120 grains—that of the earliest British coins—is B.C. 226. Probably, however, there was a less tendency to reduce the weight and quality at the beginning than towards the end of the series, but the coins justify us in saying that the inhabitants of southern Britain were sufficiently civilised to make use of a coinage about 150 years before Christ, or 100 years before the time of our first Roman visitor, Julius Cæsar, if not indeed at an earlier period.

Besides these gold, silver, and brass or copper coins, with devices upon them derived from Gaulish copies of a Macedonian original, there are other coins cast in tin, with devices in imitation of some coins of Marseilles, in the South of France, which also tell us the same story of a close intercourse with Gaul. Many of these were cast in wooden moulds, as is proved by the grain of the wood being visible in relief upon them. Such coins have been found with iron tools and weapons in the ancient encampment of Mount Caburn, near Lewes; but iron or steel must have been in use for some four or five centuries in this country before the time of Cæsar's invasion.

In graves which must belong to the first few centuries before Christ, we find swords of iron with ornamental bronze sheaths; and there are highly decorated shields with artistic scroll patterns upon them, and sometimes with ornaments of red enamel, which belong to the same period. The warriors of those times had horses and chariots, the latter with iron tires and linch-pins to the wheels, and the harness of the former

provided with bronze and enamelled buckles. Of this Early Iron Age, however, we learn more from the remains of ancient dwellings and cemeteries on the Continent. In one of these cemeteries at Hallstatt, in the Austrian Tyrol, upwards of a thousand graves have been examined; and as it was the custom to bury with the dead a number of objects of an ornamental or useful kind—possibly with the view that they might be of service in a future state of existence—we are able to reconstitute the surrounding conditions of their life. Great care was bestowed upon their weapons, some of the swords having hilts of ivory inlaid with amber, both probably derived from foreign commerce; some daggers had golden sheaths; their helmets were of bronze, as were also their girdles, bracelets, and brooches, which present an infinity of different forms. Their pottery was of graceful shape, and some of it highly ornamented. Many of their vessels were made of bronze, sometimes artistically ornamented, with figures of animals—as, for instance, a milk-cup, the handle of which is in the form of a cow with a calf behind her.

But mixed with these graves containing iron weapons are others in which swords, spear-heads, and hatchets of bronze have been found; and it is a remarkable circumstance that the iron weapons appear to have been imitated from those of bronze. cannot go into the details of the matter, but I may observe that the forms, though readily cast in bronze, are exceedingly difficult to forge in iron; and the only inference that can be drawn from this fact is this, that the bronze weapons and tools must have been in use at the time when iron was introduced as a substitute for the softer metal.

But if iron or steel thus superseded bronze, there must have been a time when bronze was the only metal in use for weapons and tools, and to this period antiquaries have given the name of the Bronze Age. Such terms as Iron Age, Bronze Age, or Stone Age mean, however, only certain stages of civilisation, and not only chronological periods applicable to the whole of the world; for while the inhabitants of one country had acquired a knowledge of iron and had given up bronze for such weapons as swords, in other countries bronze may still have been in use, and in others again it may have been entirely unknown. Here in the South of Britain iron, as already remarked, is thought to have been in use some four or five centuries B.C., and before that time we have evidence of the prevalence of a Bronze Age in Britain probably for a period of not less than ten centuries. We can read this chapter in our history partly by the contents of ancient grave-mounds or barrows, and partly by means of the bronze objects found dispersed in the soil. Bronze, or, as we now generally call it, gun-metal, is a mixture of copper and tin, and the proportions which produce the toughest and most useful alloy are about nine of copper to one of tin. No doubt in some part of the world, probably Asia, native copper, such as is found in so many countries, was first in use; but at present the traces of this copper-using age are on this side of the Atlantic but faint. On the other side, in some parts of the United States, numerous instruments of pure copper have been found. These have been hammered out cold from native copper, and not cast. Where and when it was discovered that the admixture of a small proportion of the softer metal, tin, made copper harder and more fusible, is at present a mystery; but it is remarkable that the same discovery seems to have been made in the New World as in the Old, for some of the weapons and tools of Peru, made before there was any contact with Europeans, are manufactured from bronze of the ordinary composition. Here in Britain, our Bronze Period is well illustrated by relics, representations of some of which are shown upon the wall. The swords, spear-heads, daggers, and shields speak for themselves, and exhibit marvellous skill in the art of casting and hammering out. The various tools may also be recognised, and many, such as the chisels and gouges, do not differ materially from those of the present day. The hatchets or axes are either flat blades, sometimes with wings or flanges at the sides, or are cast with a socket to receive a crooked haft. In this country they are never provided with an eye for the helve like our modern axes. The way in which the socketed form was developed from the flat blade is susceptible of being traced, and we can learn from the hatchets themselves that the art of producing them with a socket was a foreign invention, and not originally discovered in this country. Let me dwell on this for a minute. The flat blade, which was cast in a single open mould and hammered into shape, was no doubt the earliest form. It, moreover, closely resembles some of the earlier hatchets made of another material, to which I shall presently have to call your attention. But these flat blades, it was

found, could be rendered stronger by being hammered at the sides so as to form flanges upon them, much like those on modern rails. The blades were next cast with these flanges upon them, and it was then found advantageous to make them expand in the middle of the blade, so as to allow them to embrace the two sides of the split haft in which they were mounted. Eventually these projecting wings were hammered over so as to produce a kind of semicircular pocket for the haft on each side of the blade. At this stage a brilliant idea occurred to some ancient founder, and by means of a clay core he produced a single socket in the body of the blade itself, and thus did away with the labour of hammering out the wings on the flat blade and turning them over, and also with the trouble involved in making a deep notch in the haft, so that it might run down each side of the blade. But these semicircular wings had become a recognised feature in this class of hatchets, and out of regard to this fashion the earliest of the socketed blades were cast with the two wings on each face, in imitation of those of the older form. As has so often been the case in such developments, what was at one time of essential service survives at another as a useless ornament. And now comes in this little bit of history which these hatchets enable us to read. It is evident that the first socketed blades must have been cast in a country where the prevailing type of hatchet had the semicircular wings on each face; but this kind of hatchet, though abundant in some parts of the Continent, is very rare in Britain, and we are therefore justified in concluding that the art of casting hatchets with a socket was introduced into this country from abroad. Not but what our native founders cast plenty of hatchets of this socketed pattern when once they were acquainted with it, for the moulds for producing them have been found with lumps of metal and various bronze objects in different parts of the Kingdom.

Not only were the bronze-using people skilful as founders, but they understood how to work ornaments in amber and jet as well as in gold, and some few specimens of their ornamental inlaying are such as would do credit to any modern workman. The wooden handle of a bronze dagger found in the grave of a warrior in Wiltshire was inlaid with thousands of minute gold pins, arranged in regular patterns, and the amber pommel of a dagger found in Devonshire was as delicately inlaid with gold as any tortoise-shell patch-box of the last century.

The history of man in the bronze-using stage is, however, better read on the Continent than here. On the shores of many of the lakes of Switzerland, Italy, and the South of France the remains of settlements belonging to the Bronze Age have been discovered. As a safeguard against enemies and wild beasts, it was a custom in those times to construct artificial islands, or platforms carried on piles above the water, on which to erect their dwellings. The same custom also prevailed within the historic period both in Europe and Asia, and something of the same kind was practised in Ireland until comparatively recent times. A similar custom has been observed in other parts of the world by modern travellers. In such buildings, from time to time, disastrous fires occurred, and what was thus lost to the original occupants has been preserved beneath the waters for the instruction of long subsequent ages. Their houses seem to have been formed of interlaced boughs smeared over with mud, after the manner we now term "wattle and daub." They understood the art of spinning and weaving both woollen and linen cloth. Of domesticated animals they possessed the dog, ox, sheep, goat, pig, and finally the horse. In this country they hunted the red deer, the roe, the wild boar, the hare, and some other animals. But they also were to some extent agriculturists, and reaped their corn with bronze sickles. They made vessels of various shapes in burnt clay, but were unacquainted with the potter's wheel, though some cups of amber and a soft kind of jet were apparently turned in a lathe. Though using so many and such well-made tools and weapons of bronze, a certain number of appliances for both peaceful and warlike purposes were made of stone. The skins which they prepared as leather were scraped by means of flint scrapers. Their arrow points were made of flint, and their battle-axes and war maces were in this country carefully wrought out of stone. From the number and varieties of the bronze-instruments found in Britain, it has been inferred that their use must have extended over several centuries, and it seems probable that the beginning of our Bronze Period dates back to at least some 1,200 or 1,400 years B.C. Such a date also seems to agree fairly well with what we learn from history as to the trading visits of the Phenicians to this country in search of tin.

(To be continued.)

### RECENT PROGRESS IN TELEPHONY<sup>1</sup>

THE Telephone was first introduced to the British public at the meetings of the British Association. In 1876, at Glasgow, Sir William Thomson startled his hearers by announcing that he had heard, in Philadelphia, Shakespeare quoted though an electric wire, by the aid of the invention of Mr. Graham Bell, which he then pronounced to be "the greatest by far of all the marvels of the electric telegraph." In 1877, at Plymouth, I had the pleasure of showing in actual operation the finally developed instrument now known as the Bell Telephone, which I had just brought over from America; and conversation was actually maintained between Plymouth and Exeter. Five years have elapsed since then, and it is fitting that the British Association should hear of the progress of this astonishing apparatus.

In 1877, it was a scientific toy; it has now grown to be a practical instrument. 1,550,000*l.* capital is already embarked in its extension in England, and it is earning a revenue of 109,000*l.* Hitherto it has been practically a monopoly in the hands of a private company, who hold the controlling patents, and of the Post Office, who possess the controlling power, but this monopoly has been broken, and we are about to witness severe competition. It is often said that competition in any business will have the effect of reducing the rates charged to the public, but the experience of the past in railways and telegraphs scarcely teaches this lesson. Undue competition tends to lower the rates for a time, but it eventually leads to amalgamation—to the absorption of the weak by the strong—to swollen and watered capital, and, finally in many instances to higher rates to a too-confiding public. Competition, however, induces better service, and ultimately, in this respect, the public gain.

The free traffic in patents, however, leads to jobbery and speculation of the worst type. We have recently seen a mania for electric speculations that almost rivals the South Sea Bubble period. The public have wildly rushed into ill-matured schemes that have swollen the purses of gambling promoters, have turned the heads of inventors, have retarded the true progress of the beneficial application of this new science to the wants of man, and have thrown away millions upon imperfect schemes. Much has been said against the monopoly of the Post Office in telegraphic business, but at any rate it has the merit that it has checked the rapacity of company promoters and patent-mongers in that branch of the practical application of electricity, while no one can assert that it has checked the progress of telegraphy. During the first week that the telegraphs in this country were transferred to the State, the total number of messages transmitted was 26,000, while in the week ending August 11th it amounted to 724,000. There is no inventor who can assert that his scheme has not received proper consideration, nor show a real improvement that has not been adopted and remunerated; while the improvements of the Post Office itself are freely adopted by other countries, and America itself—the home of the inventor—has found the advanced system of England worthy of acceptance.

*Receivers.*—The original telephone receiver of Bell has scarcely been improved upon; it remains in form and construction very nearly the same as that which I exhibited in 1877. The perfection of its working depends upon the truth and perfection of its manufacture. It is now more solid and substantial than it was at first, more powerful magnets are used; but still it is the same simple, marvellous, and beautiful instrument that I brought over from America. Mr. Gower has increased its loudness by varying the form of its various parts, and using very powerful horse-shoe magnets of peculiar form; but experience shows that loudness is always obtained at the expense of clearness of articulation; and, although for many purposes the Gower-Bell instrument, which is adopted by the Post Office and is now in use to connect together all the sections of the British Association scattered through the town of Southampton, is more practical, nothing for delicate articulation surpasses the original Bell.

The Paris Exhibition of last year, so fruitful in electrical novelties, did not bring forth any marked improvement in telephonic apparatus. It was noticeable chiefly for its practical applications of the telephone, and particularly to the transmission of singing and music to a distance. M. Ader's modification of Bell's receiver is that almost universally used in Paris. It is a

<sup>1</sup> Paper read at the Southampton meeting of the British Association. Revised by the author.